

## PATENT ABSTRACTS OF JAPAN

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(22)Date of filing : 30.06.1993

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## (54) PRODUCTION OF WATER ACTIVATOR

## (57)Abstract:

PURPOSE: To obtain a water activator for purifying water with enhanced activation effect and capable of being provided inexpensively by screening primary granulated matter composed of diatomaceous earth to produce seed particles and secondarily granulating these seed particles and subjecting the secondary granules to primary and secondary baking processes at specific temps.

CONSTITUTION: Diatomaceous earth is dried and ground to a 50 mesh or less and the ground diatomaceous earth is granulated using water to obtain primary granules which are, in turn, screened to produce seed particles. Next, these seed particles are secondarily granulated using water by a granulator heated to 30-60° C and the secondary granules are dried. Subsequently, these secondary granules are primarily baked at 150-250° C for 10-20hr and succeedingly secondarily baked at 600-900° C) for 4-24hr to produce a required water activator. The water activator is reduced in water molecule group (cluster) and discharges various minerals and minor elements and emits far infrared rays. Therefore, the water activator can be enhanced in water activating action and can be inexpensively produced.

## LEGAL STATUS

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CLAIMS

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[Claim(s)]

[Claim 1] Dry diatomaceous earth, grind to 50 or less meshes, and it corns primarily using water. \*\*\*\* which carried out the primary granulation object the screen exception, manufactured \*\*\*\*, and was manufactured in this way is secondarily corned using water with the granulating machine under warming at 30-60 degrees C. A secondary granulation object is dried, and it calcinates primarily by 150 - 250 \*\* for 10 to 20 hours, and ranks second. The manufacture approach of the running water agent characterized by calcinating secondarily by 600 - 900 \*\* for 4 to 24 hours.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the manufacture approach of the running water agent used for water purification.

[0002]

[Description of the Prior Art] Recently, the importance of water is recognized and purifying [ many ] water by the boiled-mixture-of-rice-and-barley stone or the commercial water purification agent are performed. Moreover, a chemical or electrolysis separated water into weak acidic water and weak alkaline water, cosmetics, such as washing its face, is presented with weak acidic water, and drink is presented with weak alkaline water.

[0003]

[Problem(s) to be Solved by the Invention] Although the boiled-mixture-of-rice-and-barley stone and the commercial water purification agent are effective, it is necessary to exchange frequently and costs are also by no means cheap. Then, it is activity further and the water purification agent also with cheap costs was called for conventionally.

[0004]

[Means for Solving the Problem] Rather than the conventional boiled-mixture-of-rice-and-barley stone or a commercial water purification agent, this invention is activity further and aims at costs offering a cheap water purification agent. Moreover, it not only offers a cheap water purification agent, but this water purification agent only makes a water molecule ensemble (cluster) small in high activity, and in order that this invention may emit various minerals and a trace element and may emit far infrared rays, it aims at offer of the running water agent which has the operation which activates water.

[0005] This invention dries diatomaceous earth, grinds it to 50 or less meshes, and is primarily corned using water. \*\*\*\* which carried out the primary granulation object the screen exception, manufactured \*\*\*\*, and was manufactured in this way is . secondarily corned using water with the granulating machine under warming at 30-60 degrees C. A secondary granulation object is dried, and it calcinates primarily by 150 - 250 \*\* for 10 to 20 hours, and ranks second. It is the manufacture approach of the running water agent characterized by calcinating secondarily by 600 - 900 \*\* for 4 to 24 hours.

[0006] By any approaches other than this invention, the running water agent concerning this invention cannot be manufactured. Since the running water agent concerning this invention does not have the manufacture approach of the conventional known, it cannot compare the manufacture approach of this invention with the conventional manufacture approach.

[0007] The major components of diatomaceous earth are 50.0 - 60.0% of silicic anhydrides, 11.0 - 15.0% of aluminum oxides, an iron oxide 3.0 - 5.5 %, a calcium oxide 2.5 - 4.5 %, a magnesium oxide 1.0 - 2.0 %, sulfur 0.6 - 1.5 %, the oxidization potassium 0.3 - 3.8 %, sodium oxide 0.03-2.8 %, and titanium oxide 0.1 - 0.5 % on weight criteria about. specific surface area — 35.0-40.0m<sup>2</sup>/g, pore volume 0.26 to 0.40, the average pore radius 450 - 550 \*\*, and pH 7.1-7.6 it is . Production of the diatomaceous earth used as the raw material of such a running water agent is restricted to few [ for the moment ] parts in Japan. An example of the component of the diatomaceous earth used for this invention is shown in the 1st table, an example of physical properties is shown in the 2nd table, and the comparison of physical properties with other adsorbents is shown in the 3rd table.

[0008]

[A table 1]

## 本発明に用いる珪藻土の化学成分

成 分		値 (%)
無水珪酸	$\text{SiO}_2$	55.00
酸化アルミニウム	$\text{Al}_2\text{O}_3$	13.00
酸化鉄	$\text{Fe}_2\text{O}_3$	4.10
酸化カルシウム	$\text{CaO}$	3.60
酸化マグネシウム	$\text{MgO}$	1.60
酸化カリウム	$\text{K}_2\text{O}$	0.57
酸化ナトリウム	$\text{Na}_2\text{O}$	0.05
酸化チタン	$\text{TiO}_2$	0.20
硫 黄	$\text{S}$	1.10
酸化リン	$\text{P}_2\text{O}_5$	0.07
酸化コバルト	$\text{CoO}$	0.06
酸化マンガン	$\text{MnO}$	0.04
酸化ホウソ	$\text{B}_2\text{O}_3$	0.009
酸化バリウム	$\text{BaO}$	0.008
酸化ストロンチウム	$\text{SrO}$	0.008
酸化スズ	$\text{SnO}_2$	0.008
酸化亜鉛	$\text{ZnO}$	0.007
酸化バナジウム	$\text{V}_2\text{O}_5$	0.005
酸化ニッケル	$\text{NiO}$	0.003
酸化銅	$\text{CuO}$	0.001
付 着 水 分		残 余

(茨城県公害防止協会の分析による)

[0009]

[A table 2]

物 性

比表面積 $\text{m}^2/\text{g}$	37.8	平均細孔半径 $\text{\AA}$	500.0
細孔容積 $\text{cm}^3/\text{g}$	0.324	表 面 pH	7.4

[0010]

[A table 3]

## 本発明に用いる珪藻土と他の吸着材の物性の比較

	比表面積 ( $\text{m}^2/\text{g}$ )	細孔容積 ( $\text{cm}^3/\text{g}$ )	平均細孔 半径 ( $\text{\AA}$ )	表面 pH
本発明に係る珪藻土	37.80	0.324	500.0	7.40
クリストバライト	62.25	0.39	125.0	5.65
ヤシガラ活性炭	912.00	0.50	11.1	10.70
石炭系活性炭	652.00	0.71	21.9	10.20
ゼオライトモルデナイト	18.60	0.24	259.0	9.20
ゼオライトクリノプチロライト	20.60	0.12	112.0	9.20

[0011] A suitable grinder grinds diatomaceous earth to 50 or less meshes. If it dries whether it is left over time amount even if it is usually mined in lump about 10cm or less, since elasticity [ diatomaceous earth ], it will decompose into a small lump about 2-3cm or less easily. It is desirable to grind this small lump. Since it cannot adhere and grind to a grinder at BETOBETO unless it dries before grinding, it dries before grinding. A shaping assistant, a thickener, a pore forming material, sintering acid, etc. may be added to the diatom powder obtained in this way. Although it was remarkably difficult for this invention person to corn diatomaceous earth powder only with water, it found out that diatomaceous earth powder could be corned only with water as a result of great efforts and various test researches.

[0012] Diatomaceous earth powder is primarily corned for the purpose of about 4-5mm \*\*\*\* using the pelletizer of a pot mill mold or a pan mold so that the decorative paper ball of fireworks may be built. The magnitude of \*\*\*\* can be changed according to the application of a product.

[0013] if it carries out after primary granulation and a screen exception and a granule smaller than \*\*\*\* is returned and re-corned to a primary granulation — \*\*\*\* — \*\*\*\* of uniform magnitude is obtained. Unlike a secondary granulation, a primary granulation cannot be corned if a granulating machine is warmed.

[0014] When corned \*\*\*\* secondarily, it is necessary to warm a granulating machine. although a granulating machine is touched, and a container is warmed at about 30 degrees C or more with direct fire from an outer wall a little so that tepidly — warming — economical viewpoints, such as costs, to an upper limit is about 60 degrees C or less. Suitable temperature is about 40-50 degrees C.

[0015] If diatomaceous earth powder and water are supplied to \*\*\*\* while the front face of \*\*\*\* maintains at the condition that it gets dry and is visible, in a secondary granulation, and it corns, heating a granulating machine, the grain to which particle size was equal will be obtained. If it does not heat, when taking time amount, the grain to which particle size was equal is not obtained. Usually, a thing with a diameter of about 18mm is corned to potable water, a thing with a diameter of about 10mm is corned to a bath and a pool, and a thing with a diameter of about 40mm is corned to a food grade.

[0016] It dries and a secondary granulation object removes free moisture. Although quality and the field of cost to the air drying of desiccation is desirable and the air drying which avoided especially direct sunlight is desirable, a forced drying is sufficient, as long as a secondary granulation object does not break but it approves from a cost side.

[0017] Baking cannot be calcinated but it is necessary to calcinate it two steps by the simple baking approach. Primary baking is performed by imposing the long duration of 10 - 20 hours by 150 - 250 \*\*, if its temperature is low, its firing time is long, and its firing time is short if it is high. Usually, it is 10 - 14 hours in 180 - 220 \*\*.

[0018] Secondary baking is performed by 600 - 900 \*\* for 4 to 24 hours. usually, potable water and food-grade water — before baking — about — since it is more desirable to have calcinated by about 800 - 860 \*\* for 20 to 24 hours, and for the object for baths to have the moderate sulfur content S so that volatilization clearance of the sulfur content S 1.1 % included may be carried out and it may drop to about 0.25% after baking — about 4 - 5 hours — short-time baking is carried out. The electric furnace of baking is good with a gas furnace and a not sufficient petroleum furnace.

[0019]

[Function] Since the conventional adsorbent has a small pore radius, it can stick only to being stinking and the ion exchange of varieties is not made, so that clearly from the 3rd table, but since the diatomaceous earth used for this invention has a large pore radius, it it not only can absorb a smell, but can exchange the ion of a variety large quantity.

[0020] This invention takes pains [ calcinate / how / without destroying big pore / corn and / diatomaceous earth which was illustrated to the 1st table and the 2nd table ], and is successful at last. If it corns round to a globular form, when porosity can be maintained, handling is easy and it is easy to be filled up with it uniformly. Moreover, even if it becomes granulative with the powder which the front face sintered, in order that granulative one may not fall, porosity can be maintained and activity capacity does not fall. Pore is not plugged up in order to calcinate at the temperature which it does not interfere, but a diatomaceous earth particle melts in secondary baking, and does not vitrify gas falling out and generating porosity between diatomaceous earth particles in order to calcinate primarily at low temperature.

[0021] The running water agent of this invention has the \*\*\*\*\* structure of a hexagon, and since it is porosity, it adsorbs underwater impurity \*\*\*\* and a water scale. Moreover, since minerals, such as calcium, magnesium, and a potassium, are contained in abundance, water is made delicious, there is a lustrous skin operation, and there is an animals-and-plants growth promotion operation. Furthermore, while activating water for a water molecule as a small group (cluster) of three to 4 molecule centering on mineral ion Since there is far-infrared radiation, the offensive odors of water and dirt decrease in number and a molten bath boils early, are economical. A molten bath is mellow, a hydrothermal process occurs, there is an operation which makes quick delicious the dish of cooking rice, simmered dishes, tempura, pickles, etc., and there is an operation which makes delicious miso soup, a pan, a paste, vegetables, fruit, alcohol, coffee, tea, and a noodles rainy season, and improves Japanese \*\*. Decompose by the ion exchange, and the insoluble lime in soil, heavy metal, agricultural chemicals, etc. control propagation of

saprophytic bacteria, make plankton work actively with a useful microorganism, and have the operation which neutralizes acid rain further again.

[0022] Since the running water agent of this invention contains minerals, such as Mg and calcium, so much and is eluted in underwater and optimum dose prolonged minerals, minerals take the lead in a water molecule ensemble (cluster), and it makes a water molecule ensemble small. Usually, since, as for the running water agent of this invention, \*\*\*\* will emit far infrared rays with a wavelength of 6-14 micrometers by returning to the original big water molecule ensemble if time amount passes, and the outer electron of the atom of minerals is excited from a ground state and activated, time amount with a small water molecule ensemble also maintains the water molecule ensemble who became small for a long time. For example, compared with 12 molecules of a water molecule ensemble in case there are no minerals that the water molecule ensembles who gather around the ion of minerals, such as calcium, are for example, three molecules, it becomes easy to commit minerals, such as calcium. For this reason, the running water agent of this invention has high activity, and is not a mere water purification agent.

[0023] An example of the oscillating wavelength which measured the water which processed the example of 1 analysis at the time of processing water for the example of 1 analysis of the running water agent of this invention to the 4th table to the 5th table, and processed an example of far infrared spectra to drawing 1 by NMR is shown in drawing 2.

[0024]

[A table 4]

#### 本発明の活水剤の化学成分

成 分	分 析 結 果 (%)	分析方法
SiO <sub>2</sub>	71.3	重量法
Al <sub>2</sub> O <sub>3</sub>	12.00	ICP法
Fe <sub>2</sub> O <sub>3</sub>	5.33	"
CaO	3.45	"
MgO	1.62	"
K <sub>2</sub> O	2.60	"
Na <sub>2</sub> O	2.39	"
TiO <sub>2</sub>	0.33	"
S	0.25	重量法
P <sub>2</sub> O <sub>5</sub>	0.11	"
CoO	0.022	"
MnO	0.11	"
B <sub>2</sub> O <sub>3</sub>	0.001	"
BaO	0.043	"
SrO	0.020	"
SnO <sub>2</sub>	0.001以下 (検出限界)	"
ZnO	0.18	"
V <sub>2</sub> O <sub>5</sub>	0.010	"
NiO	0.12	"
CuO	0.002	"
Pb	0.002以下 (検出限界)	"
Cr	0.003	"
Ge	0.001以下 (検出限界)	"

(株)日本化学環境センターの分析による)

[0025]

[A table 5]

## 水を処理した場合の分析例

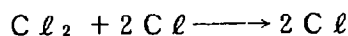
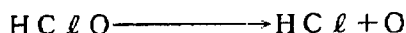
(mg/l)

水 中 元 素	処 理 前	処 理 後
カルシウム	0.25	205.86
カドミウム	1.81	< 0.003
銅	107.74	0.10

(新日本製鉄釜石製作所釜石試験分析センターにて分析)

[0026] The running water agent of this invention is pH 7.2 [ about ] so that an elution volume may reach a balance in 200 mg/l extent, although pH ranks high 8-9th when chemical for water treatment with much elution of calcium ion is used. Alkaescence is maintained. If the water of a pool is processed, residual chlorine will adsorb and a chlorine smell will decrease. This is based on the following reaction formula.

[Equation 1]



[0027] The running water agent of this invention has large ion exchange capacity. Since validity is high, there is little amount used and it ends. It can be used into a water receiving tank, exchanging for the conventional water purification agent. The filter medium is unnecessary. To a hot spring or a pool, the filter medium of a filter can be substituted as it is. If the processed water is used for agriculture, since a noxious insect will stop being attached to vegetation easily, low-levels-of-pesticide-ization is realizable. Moreover, the used agricultural chemicals are absorbed and it is effective in decreasing phytotoxicity.

[0028]

[Example] Next, this invention is explained to a pan per example at a detail.

The diatomaceous earth of the presentation shown in the example 1 1st table is opened thinly, and it will dry by solar drying for two to three days, and is 50-150 with a crusher. 50 % of the weight of mesh, and 150-300 30 % of the weight of mesh, and 300 lt ground to 20% of the weight of grain size below a mesh. \*\*\*\* with a diameter of about 4-5mm was manufactured so that the decorative paper ball of fireworks might be built for this powder using water with a granulating machine. The grain smaller than about 4mm was carried out the screen exception, and was returned to the granulating machine. Water and diatomaceous earth powder were added and corned, taking care so that it may be visible to the condition that the front face of a ball got dry, putting \*\*\*\* into a panmold pelletizer and heating the base of a pan at about 40 degrees C by the liquefied-petroleum-gas burner from a lower part. three kinds of the thing for potable water with a diameter of about 18mm in the magnitude of a granulation object, and the thing about 10mm bath and for a pool and the thing of about 40mm food grade — carrying out — respectively — \*\*\*\* — the thing of a uniform particle size was obtained. The profit slack granulation object was made to dry in the shade for five - 20 days according to particle size, and it dried. Subsequently, after calcinating primarily by 200 \*\* for 12 hours, the thing of the object for potable water and a food grade was secondarily calcinated by 850 \*\* for 24 hours, and the thing for a bath and a pool was calcinated for 4 hours. It was as the physical properties of the running water agent obtained in this way being shown in drawing 1, and a chemical entity being shown in the 3rd table. The oscillating wavelength at the time of processing water was as being shown in drawing 2. When 1t of water was processed for 6 hours by 5kg of running water agent abbreviation of this invention for potable water, a processing front and after processing, as shown in the 3rd table, it adsorbed, heavy metal decreased in number, and calcium ion was eluted so much.

[0029] When about 1kg per 1t of water was used for vegetation, the object for agricultural products, the pond, the object for live-boxes or the bath, and the pool, vegetation grew, water defecated and the smell was lost. When about 5kg per 1t of water was used for potable water, it became delicious water containing an optimum dose mineral. The food grade became delicious when two things of the diameter of 40mm were used for 1l. of water, having followed them as the rule of thumb, and Japanese \*\* became good.

[0030]

[Effect of the Invention] The running water agent of this invention removes underwater dirt, an impurity, \*\*\*\*, a water scale, and an offensive odor. Consider as delicious potable water which contains a mineral in abundance, defang chemical fertilizer, agricultural chemicals, etc., and the plankton of a golf course or a farm, a microorganism, and animals and plants are activated. While it boils [ promote growth, make a water molecule ensemble (cluster) small and / a molten bath / early ] according to a far-infrared operation and is economical, are mellow. Since grace will be given to the desiccation skin if it is made moisturization Myst, there is a beautiful skin effect. If it puts into the water tank of a humidifier, an indoor moisturizincy effect will increase, if treated water is sprayed, hair will carry out gently and will become pliant, if it puts in in a towel steamer, a towel carries out puffily and an offensive odor is not attached. Japanese noodles, a side, Aging of reports, such as confectionery and a pan, becomes early, flower arrangement lasts long, and the dish of cooking rice, simmered dishes, tempura, pickles, etc. is made delicious and quick. Miso soup, a pan, the dried seaweed, dried boiled fish, kelp, wakame seaweed, alcohol, coffee, tea, tea, a noodles rainy season, etc. are made delicious, and Japanese \*\* is improved, the freshness of vegetables and fruit is maintained, acid rain is neutralized, low-levels-of-pesticide-ization can be realized, and there is little amount used and it ends. Moreover, since the conventional water purification agent, a filter medium, and a boiled-mixture-of-rice-and-barley stone can be substituted as it is, the tooth space of an excess is not needed.

[0031] When it was used for the bath, the pool, etc., compared with the case where the conventional filter medium is purchased, installation expense could be mitigated about 70%, the count of a scupper decreased, costs could be mitigated about 30%, it boiled, and the electrical charges of a molten bath have decreased about 20%.

[0032] Running water agent of this invention It is water 200 of a drum about 200 pieces. When it put in into the liter for 24 hours

and a chrysanthemum and the grass of a golf course were sprinkled in this water every day during about two months, compared with the chrysanthemum and grass which sprinkled tap water, growth was about 3 times good, and green was deep (one to reference photograph 2 reference). moreover, the running water agent of this invention -- when ten pieces were put into 1l. water for 6 hours and KARANKOE and spa tee HIRAMU were sprinkled in this water every day during one month and five months, respectively, compared with the flower which sprinkled tap water, growth was about 2 to 3 times good (three to reference photograph 4 reference). sakaki is put in the carboy into which the water of 200cc was put further again, when two running water agents of this invention are put in and placed, even if three months pass, sakaki does not wither, but a new branch buds conversely, and it grows up flourishing, and is now -- it is alike and growth is continued (reference photograph 5 reference).

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[Translation done.]



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TECHNICAL FIELD

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[Industrial Application] This invention relates to the manufacture approach of the running water agent used for water purification.

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[Translation done.]

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PRIOR ART

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[Description of the Prior Art] Recently, the importance of water is recognized and purifying [ many ] water by the boiled-mixture-of-rice-and-barley stone or the commercial water purification agent are performed. Moreover, a chemical or electrolysis separated water into weak acidic water and weak alkaline water, cosmetics, such as washing its face, is presented with weak acidic water, and drink is presented with weak alkaline water.

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[Translation done.]

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EFFECT OF THE INVENTION

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[0032] Running water agent of this invention It is water 200 of a drum about 200 pieces. When it put in into the liter for 24 hours and a chrysanthemum and the grass of a golf course were sprinkled in this water every day during about two months, compared with the chrysanthemum and grass which sprinkled tap water, growth was about 3 times good, and green was deep (one to reference photograph 2 reference). moreover, the running water agent of this invention -- when ten pieces were put into 1l. water for 6 hours and KARANKOE and spa tee HIRAMU were sprinkled in this water every day during one month and five months, respectively, compared with the flower which sprinkled tap water, growth was about 2 to 3 times good (three to reference photograph 4 reference). sakaki is put in the carboy into which the water of 200cc was put further again, when two running water agents of this invention are put in and placed, even if three months pass, sakaki does not wither, but a new branch buds conversely, and it grows up flourishing, and is now -- it is alike and growth is continued (reference photograph 5 reference).

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[Translation done.]

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] Although the boiled-mixture-of-rice-and-barley stone and the commercial water purification agent are effective, it is necessary to exchange frequently and and costs are also by no means cheap. Then, it is activity further and the water purification agent also with cheap costs was called for conventionally.

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[Translation done.]

## MEANS

[Means for Solving the Problem] Rather than the conventional boiled-mixture-of-rice-and-barley stone or a commercial water purification agent, this invention is activity further and aims at costs offering a cheap water purification agent. Moreover, it not only offers a cheap water purification agent, but this water purification agent only makes a water molecule ensemble (cluster) small in high activity, and in order that this invention may emit various minerals and a trace element and may emit far infrared rays, it aims at offer of the running water agent which has the operation which activates water.

[0005] This invention dries diatomaceous earth, grinds it to 50 or less meshes, and is primarily corned using water. \*\*\*\* which carried out the primary granulation object the screen exception, manufactured \*\*\*\*, and was manufactured in this way is secondarily corned using water with the granulating machine under warming at 30-60 degrees C. A secondary granulation object is dried, and it calcinates primarily by 150 - 250 \*\* for 10 to 20 hours, and ranks second. It is the manufacture approach of the running water agent characterized by calcinating secondarily by 600 - 900 \*\* for 4 to 24 hours.

[0006] By any approaches other than this invention, the running water agent concerning this invention cannot be manufactured. Since the running water agent concerning this invention does not have the manufacture approach of the conventional known, it cannot compare the manufacture approach of this invention with the conventional manufacture approach.

[0007] The major components of diatomaceous earth are 50.0 - 60.0% of silicic anhydrides, 11.0 - 15.0% of aluminum oxides, an iron oxide 3.0 - 5.5 %, a calcium oxide 2.5 - 4.5 %, a magnesium oxide 1.0 - 2.0 %, sulfur 0.6 - 1.5 %, the oxidation potassium 0.3 - 3.8 %, sodium oxide 0.03-2.8 %, and titanium oxide 0.1 - 0.5 % on weight criteria about. specific surface area — 35.0-40.0m<sup>2</sup>/g, pore volume 0.26 to 0.40, the average pore radius 450 - 550 \*\*, and pH 7.1-7.6 it is . Production of the diatomaceous earth used as the raw material of such a running water agent is restricted to few [ for the moment ] parts in Japan. An example of the component of the diatomaceous earth used for this invention is shown in the 1st table, an example of physical properties is shown in the 2nd table, and the comparison of physical properties with other adsorbents is shown in the 3rd table.

[0008]

[A table 1]

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成 分		値 (%)
無水珪酸	SiO <sub>2</sub>	55.00
酸化アルミニウム	Al <sub>2</sub> O <sub>3</sub>	13.00
酸 化 鉄	Fe <sub>2</sub> O <sub>3</sub>	4.10
酸化カルシウム	CaO	3.60
酸化マグネシウム	MgO	1.60
酸化カリウム	K <sub>2</sub> O	0.57
酸化ナトリウム	Na <sub>2</sub> O	0.05
酸化チタン	TiO <sub>2</sub>	0.20
硫 黄	S	1.10
酸化リン	P <sub>2</sub> O <sub>5</sub>	0.07
酸化コバルト	CoO	0.06
酸化マンガン	MnO	0.04
酸化ホウソ	B <sub>2</sub> O <sub>3</sub>	0.009
酸化バリウム	BaO	0.008
酸化ストロンチウム	SrO	0.008
酸化スズ	SnO <sub>2</sub>	0.008
酸化亜鉛	ZnO	0.007
酸化バナジウム	V <sub>2</sub> O <sub>5</sub>	0.005
酸化ニッケル	NiO	0.003
酸 化 銅	CuO	0.001
付 着 水 分		残 余

(茨城県公害防止協会の分析による)

[0009]

[A table 2]

物 性

比表面積 $\text{m}^2/\text{g}$	37.8	平均細孔半径 $\text{\AA}$	500.0
細孔容積 $\text{cm}^3/\text{g}$	0.324	表 面 pH	7.4

[0010]

[A table 3]

本発明に用いる珪藻土と他の吸着材の物性の比較

	比表面積 ( $\text{m}^2/\text{g}$ )	細孔容積 ( $\text{cm}^3/\text{g}$ )	平均細孔 半径 ( $\text{\AA}$ )	表 面 pH
本発明に係る珪藻土	37.80	0.324	500.0	7.40
クリストバライト	62.25	0.39	125.0	5.65
ヤシガラ活性炭	912.00	0.50	11.1	10.70
石炭系活性炭	652.00	0.71	21.9	10.20
ゼオライトモルデナイト	18.60	0.24	259.0	9.20
ゼオライトクリノプチロライト	20.60	0.12	112.0	9.20

[0011] A suitable grinder grinds diatomaceous earth to 50 or less meshes. If it dries whether it is left over time amount even if it is usually mined in lump about 10cm or less, since elasticity [ diatomaceous earth ], it will decompose into a small lump about 2-3cm or less easily. It is desirable to grind this small lump. Since it cannot adhere and grind to a grinder at BETOBETO unless it dries before grinding, it dries before grinding. A shaping assistant, a thickener, a pore forming material, sintering acid, etc. may be added to the diatom powder obtained in this way. Although it was remarkably difficult for this invention person to corn diatomaceous earth powder only with water, it found out that diatomaceous earth powder could be corned only with water as a result of great efforts and various test researches.

[0012] Diatomaceous earth powder is primarily corned for the purpose of about 4-5mm \*\*\*\* using the pelletizer of a pot mill mold or a panmold so that the decorative paper ball of fireworks may be built. The magnitude of \*\*\*\* can be changed according to the application of a product.

[0013] if it carries out after primary granulation and a screen exception and a granule smaller than \*\*\*\* is returned and re-corned to a primary granulation -- \*\*\*\* -- \*\*\*\* of uniform magnitude is obtained. Unlike a secondary granulation, a primary granulation cannot be corned if a granulating machine is warmed.

[0014] When corning \*\*\*\* secondarily, it is necessary to warm a granulating machine. although a granulating machine is touched, and a container is warmed at about 30 degrees C or more with direct fire from an outer wall a little so that tepidly -- warming -- economical viewpoints, such as costs, to an upper limit is about 60 degrees C or less. Suitable temperature is about 40-50 degrees C.

[0015] If diatomaceous earth powder and water are supplied to \*\*\*\* while the front face of \*\*\*\* maintains at the condition that it gets dry and is visible, in a secondary granulation, and it corns, heating a granulating machine, the grain to which particle size was equal will be obtained. If it does not heat, when taking time amount, the grain to which particle size was equal is not obtained. Usually, a thing with a diameter of about 18mm is corned to potable water, a thing with a diameter of about 10mm is corned to a bath and a pool, and a thing with a diameter of about 40mm is corned to a food grade.

[0016] It dries and a secondary granulation object removes free moisture. Although quality and the field of cost to the air drying of desiccation is desirable and the air drying which avoided especially direct sunlight is desirable, a forced drying is sufficient, as long as a secondary granulation object does not break but it approves from a cost side.

[0017] Baking cannot be calcinated but it is necessary to calcinate it two steps by the simple baking approach. Primary baking is performed by imposing the long duration of 10 - 20 hours by 150 - 250 \*\*, if its temperature is low, its firing time is long, and its firing time is short if it is high. Usually, it is 10 - 14 hours in 180 - 220 \*\*.

[0018] Secondary baking is performed by 600 - 900 \*\* for 4 to 24 hours. usually, potable water and food-grade water -- before baking -- about -- since it is more desirable to have calcinated by about 800 - 860 \*\* for 20 to 24 hours, and for the object for baths to have the moderate sulfur content S so that volatilization clearance of the sulfur content S 1.1 % included may be carried out and it may drop to about 0.25% after baking -- about 4 - 5 hours -- short-time baking is carried out. The electric furnace of baking is good with a gas furnace and a not sufficient petroleum furnace.

[Translation done.]

## OPERATION

[Function] Since the conventional adsorbent has a small pore radius, it can stick only to being stinking and the ion exchange of varieties is not made, so that clearly from the 3rd table, but since the diatomaceous earth used for this invention has a large pore radius, it not only can absorb a smell, but can exchange the ion of a variety large quantity.

[0020] This invention takes pains [ calcinate / how / without destroying big pore / corn and / diatomaceous earth which was illustrated to the 1st table and the 2nd table ], and is successful at last. If it corns round to a globular form, when porosity can be maintained, handling is easy and it is easy to be filled up with it uniformly. Moreover, even if it becomes granulative with the powder which the front face sintered, in order that granulative one may not fall, porosity can be maintained and activity capacity does not fall. Pore is not plugged up in order to calcinate at the temperature which it does not interfere, but a diatomaceous earth particle melts in secondary baking, and does not vitrify gas falling out and generating porosity between diatomaceous earth particles in order to calcinate primarily at low temperature.

[0021] The running water agent of this invention has the \*\*\*\*\* structure of a hexagon, and since it is porosity, it adsorbs underwater impurity \*\*\*\* and a water scale. Moreover, since minerals, such as calcium, magnesium, and a potassium, are contained in abundance, water is made delicious, there is a lustrous skin operation, and there is an animals-and-plants growth promotion operation. Furthermore, while activating water for a water molecule as a small group (cluster) of three to 4 molecule centering on mineral ion Since there is far-infrared radiation, the offensive odors of water and dirt decrease in number and a molten bath boils early, are economical. A molten bath is mellow, a hydrothermal process occurs, there is an operation which makes quick delicious the dish of cooking rice, simmered dishes, tempura, pickles, etc., and there is an operation which makes delicious miso soup, a pan, a paste, vegetables, fruit, alcohol, coffee, tea, and a noodles rainy season, and improves Japanese \*\*. Decompose by the ion exchange, and the insoluble lime in soil, heavy metal, agricultural chemicals, etc. control propagation of saprophytic bacteria, make plankton work actively with a useful microorganism, and have the operation which neutralizes acid rain further again.

[0022] Since the running water agent of this invention contains minerals, such as Mg and calcium, so much and is eluted in underwater and optimum dose prolonged minerals, minerals take the lead in a water molecule ensemble (cluster), and it makes a water molecule ensemble small. Usually, since, as for the running water agent of this invention, \*\*\*\* will emit far infrared rays with a wavelength of 6-14 micrometers by returning to the original big water molecule ensemble if time amount passes, and the outer electron of the atom of minerals is excited from a ground state and activated, time amount with a small water molecule ensemble also maintains the water molecule ensemble who became small for a long time. For example, compared with 12 molecules of a water molecule ensemble in case there are no minerals that the water molecule ensembles who gather around the ion of minerals, such as calcium, are for example, three molecules, it becomes easy to commit minerals, such as calcium. For this reason, the running water agent of this invention has high activity, and is not a mere water purification agent.

[0023] An example of the oscillating wavelength which measured the water which processed the example of 1 analysis at the time of processing water for the example of 1 analysis of the running water agent of this invention to the 4th table to the 5th table, and processed an example of far infrared spectra to drawing 1 by NMR is shown in drawing 2.

[0024]

[A table 4]

## 本発明の活水剤の化学成分

成 分	分 析 結 果 (%)	分析方法
SiO <sub>2</sub>	71.3	重量法
Al <sub>2</sub> O <sub>3</sub>	12.00	ICP法
Fe <sub>2</sub> O <sub>3</sub>	5.33	"
CaO	3.45	"
MgO	1.62	"
K <sub>2</sub> O	2.60	"
Na <sub>2</sub> O	2.39	"
TiO <sub>2</sub>	0.33	"
S	0.25	重量法
P <sub>2</sub> O <sub>5</sub>	0.11	"
CoO	0.022	"
MnO	0.11	"
B <sub>2</sub> O <sub>3</sub>	0.001	"
BaO	0.043	"
SrO	0.020	"
SnO <sub>2</sub>	0.001以下 (検出限界)	"
ZnO	0.18	"
V <sub>2</sub> O <sub>5</sub>	0.010	"
NiO	0.12	"
CuO	0.002	"
Pb	0.002以下 (検出限界)	"
Cr	0.003	"
Ge	0.001以下 (検出限界)	"

(株)日本化学環境センターの分析による)

[0025]

[A table 5]

水を処理した場合の分析例

(ng/l)

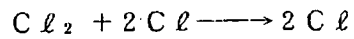
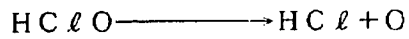
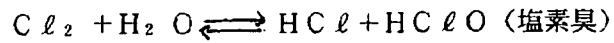
水 中 元 素	処 理 前	処 理 後
カルシウム	0.25	205.86
カドミウム	1.81	< 0.003
銅	107.74	0.10

(新日本製鉄㈱釜石製作所釜石試験分析センターにて分析)

[0026] The running water agent of this invention is pH 7.2 [ about ] so that an elution volume may reach a balance in 200 mg/l extent, although pH ranks high 8-9th when chemical for water treatment with much elution of calcium ion is used. Alkalescence is maintained. If the water of a pool is processed, residual chlorine will adsorb and a chlorine smell will decrease. This is based on the following reaction formula.

[Equation 1]





[0027] The running water agent of this invention has large ion exchange capacity. Since validity is high, there is little amount used and it ends. It can be used into a water receiving tank, exchanging for the conventional water purification agent. The filter medium is unnecessary. To a hot spring or a pool, the filter medium of a filter can be substituted as it is. If the processed water is used for agriculture, since a noxious insect will stop being attached to vegetation easily, low-levels-of-pesticide-ization is realizable. Moreover, the used agricultural chemicals are absorbed and it is effective in decreasing phytotoxicity.

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[Translation done.]

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EXAMPLE

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[Example] Next, this invention is explained to a pan per example at a detail.

The diatomaceous earth of the presentation shown in the example 1 1st table is opened thinly, and it will dry by solar drying for two to three days, and is 50-150 with a crusher. 50 % of the weight of mesh, and 150-300 30 % of the weight of mesh, and 300 It ground to 20% of the weight of grain size below a mesh. \*\*\*\* with a diameter of about 4-5mm was manufactured so that the decorative paper ball of fireworks might be built for this powder using water with a granulating machine. The grain smaller than about 4mm was carried out the screen exception, and was returned to the granulating machine. Water and diatomaceous earth powder were added and corned, taking care so that it may be visible to the condition that the front face of a ball got dry, putting \*\*\*\* into a panmold pelletizer and heating the base of a pan at about 40 degrees C by the liquefied-petroleum-gas burner from a lower part. three kinds of the thing for potable water with a diameter of about 18mm in the magnitude of a granulation object, and the thing about 10mm bath and for a pool and the thing of about 40mm food grade -- carrying out -- respectively -- \*\*\*\* -- the thing of a uniform particle size was obtained. The profit slack granulation object was made to dry in the shade for five - 20 days according to particle size, and it dried. Subsequently, after calcinating primarily by 200 \*\* for 12 hours, the thing of the object for potable water and a food grade was secondarily calcinated by 850 \*\* for 24 hours, and the thing for a bath and a pool was calcinated for 4 hours. It was as the physical properties of the running water agent obtained in this way being shown in drawing 1, and a chemical entity being shown in the 3rd table. The oscillating wavelength at the time of processing water was as being shown in drawing 2. When 1t of water was processed for 6 hours by 5kg of running water agent abbreviation of this invention for potable water, a processing front and after processing, as shown in the 3rd table, it adsorbed, heavy metal decreased in number, and calcium ion was eluted so much.

[0029] When about 1kg per 1t of water was used for vegetation, the object for agricultural products, the pond, the object for live-boxes or the bath, and the pool, vegetation grew, water defecated and the smell was lost. When about 5kg per 1t of water was used for potable water, it became delicious water containing an optimum dose mineral. The food grade became delicious when two things of the diameter of 40mm were used for 1l. of water, having followed them as the rule of thumb, and Japanese \*\* became good.

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[Translation done.]

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] Drawing showing the example of 1 measurement of the far infrared spectra of this invention running water agent.

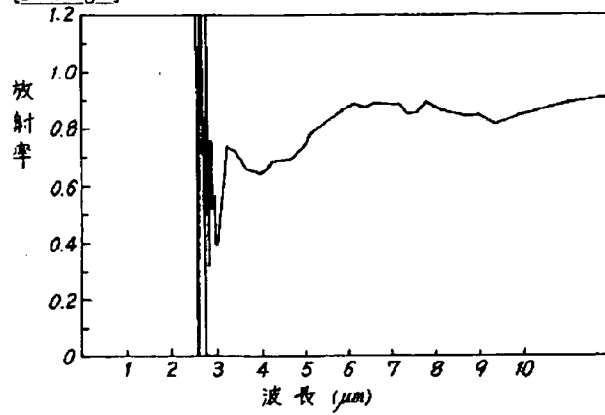
[Drawing 2] Drawing showing an example of the oscillating wavelength of the water processed by this invention running water agent.

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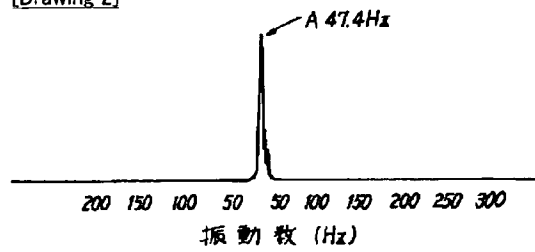
[Translation done.]

## DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]

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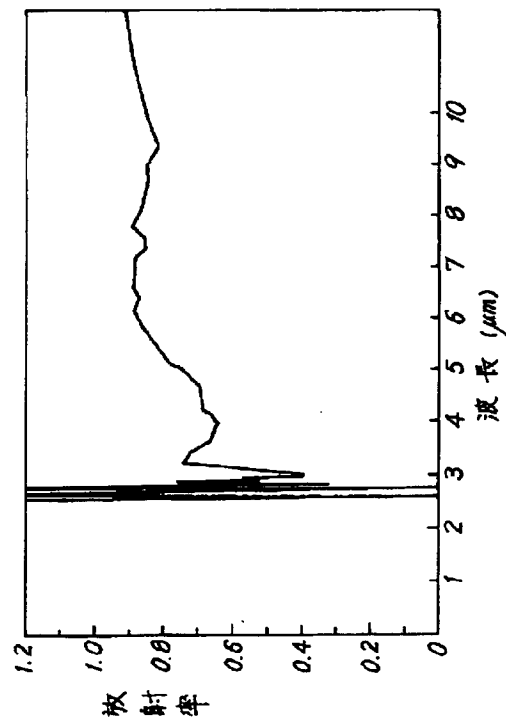
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(54) 【発明の名称】 活水剤の製造方法

(57) 【要約】

【目的】 従来の麦飯石や市販の浄水剤よりもさらに活性で、低廉であるのみならず、水分子クラスターを小さくし、ミネラル分を適量に溶出すると共に、遠赤外線をも放射する活水剤の製造方法を提供する。

【構成】 珪藻土を乾燥し、50メッシュ以下に粉碎し、一次造粒して種粒を製造し、種粒を30～60℃に加温下の造粒機で二次造粒し、乾燥し、150～250℃で10～20時間一次焼成し、次いで600～900℃で4～24時間二次焼成する。



## 【特許請求の範囲】

【請求項 1】珪藻土を乾燥し、50メッシュ以下に粉碎し、水を用いて一次造粒し、一次造粒物を篩別して種粒を製造し、かくて製造した種粒を30～60℃に加温下の造粒機で水を用いて二次造粒し、二次造粒物を乾燥し、150～250℃で10～20時間一次焼成し、次いで600～900℃で4～24時間二次焼成することを特徴とする活水剤の製造方法。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は浄水用等に使用される活水剤の製造方法に関するものである。

## 【0002】

【従来の技術】最近、水の重要性が認識され、麦飯石や市販の浄水剤で水を浄化することが多く行われている。また、薬品又は電気分解により水を弱酸性水と弱アルカリ性水とに分離し、弱酸性水を洗顔等の美容用に、弱アルカリ性水を飲用に供している。

## 【0003】

【発明が解決しようとする課題】麦飯石や市販の浄水剤は有効であるが、頻繁に交換する必要がある、また、費用も決して安くはない。そこでさらに活性であり、費用も低廉な浄水剤が従来求められていた。

## 【0004】

【課題を解決するための手段】本発明は従来の麦飯石や市販の浄水剤よりもさらに活性であり、費用も低廉な浄水剤を提供することを目的とする。また、本発明は単に高活性で低廉な浄水剤を提供するのみならず、この浄水

剤が水分子集団（クラスター）を小さくし、各種ミネラルと微量元素を放出し、遠赤外線を放射する為、水を活性化する作用を有する活水剤の提供を目的とする。

【0005】本発明は珪藻土を乾燥し、50メッシュ以下に粉碎し、水を用いて一次造粒し、一次造粒物を篩別して種粒を製造し、かくて製造した種粒を30～60℃に加温下の造粒機で水を用いて二次造粒し、二次造粒物を乾燥し、150～250℃で10～20時間一次焼成し、次いで600～900℃で4～24時間二次焼成することを特徴とする活水剤の製造方法である。

【0006】本発明以外の方法では、本発明に係る活水剤は製造できない。本発明に係る活水剤は従来既知の製造方法が無い為、本発明の製造方法を従来の製造方法と比較することができない。

【0007】珪藻土の主要成分は、大凡重量基準で無水珪酸50.0～60.0%，酸化アルミニウム11.0～15.0%，酸化鉄3.0～5.5%，酸化カルシウム2.5～4.5%，酸化マグネシウム1.0～2.0%，硫黄0.6～1.5%，酸化カリウム0.3～3.8%，酸化ナトリウム0.03～2.8%，酸化チタン0.1～0.5%である。比表面積は35.0～40.0m<sup>2</sup>/g，細孔容積0.26～0.40，平均細孔半径450～550Å，pH 7.1～7.6である。このような活水剤の原料となる珪藻土の産出は、今のところ日本国内で僅かな箇所に限られている。本発明に用いる珪藻土の成分の一例を第1表に示し、物性の一例を第2表に示し、他の吸着剤との物性の比較を第3表に示す。

## 【0008】

## 【表1】

10

20

## 本発明に用いる珪藻土の化学成分

成 分		値 (%)
無水珪酸	$\text{SiO}_2$	55.00
酸化アルミニウム	$\text{Al}_2\text{O}_3$	13.00
酸 化 鉄	$\text{Fe}_2\text{O}_3$	4.10
酸化カルシウム	$\text{CaO}$	3.60
酸化マグネシウム	$\text{MgO}$	1.60
酸化カリウム	$\text{K}_2\text{O}$	0.57
酸化ナトリウム	$\text{Na}_2\text{O}$	0.05
酸化チタン	$\text{TiO}_2$	0.20
硫 黄	$\text{S}$	1.10
酸化リン	$\text{P}_2\text{O}_5$	0.07
酸化コバルト	$\text{CoO}$	0.06
酸化マンガン	$\text{MnO}$	0.04
酸化ホウソ	$\text{B}_2\text{O}_3$	0.009
酸化バリウム	$\text{BaO}$	0.008
酸化ストロンチウム	$\text{SrO}$	0.008
酸化スズ	$\text{SnO}_2$	0.008
酸化亜鉛	$\text{ZnO}$	0.007
酸化バナジウム	$\text{V}_2\text{O}_5$	0.005
酸化ニッケル	$\text{NiO}$	0.003
酸 化 銅	$\text{CuO}$	0.001
付 着 水 分		残 余

(茨城県公害防止協会の分析による)

【0009】

【表2】

物 性

【0010】

【表3】

比表面積 $\text{m}^2/\text{g}$	37.8	平均細孔半径 $\text{\AA}$	500.0
細孔容積 $\text{cm}^3/\text{g}$	0.324	表 面 pH	7.4

## 本発明に用いる珪藻土と他の吸着材の物性の比較

	比表面積 ( $\text{m}^2/\text{g}$ )	細孔容積 ( $\text{cm}^3/\text{g}$ )	平均細孔 半径 ( $\text{\AA}$ )	表 面 pH
本発明に係る珪藻土	37.80	0.324	500.0	7.40
クリストバライト	62.25	0.39	125.0	5.65
ヤシガラ活性炭	912.00	0.50	11.1	10.70
石炭系活性炭	652.00	0.71	21.9	10.20
ゼオライトモルデナイト	18.60	0.24	259.0	9.20
ゼオライトトリブチロライト	20.60	0.12	112.0	9.20

【0011】珪藻土は適当な粉碎機により50メッシュ以下に粉碎する。珪藻土は軟質な為、通常約10cm以下の塊で採掘されても、時間を掛けて放置するか乾燥すれば容易に約2～3cm以下の小さな塊に分解する。この小さな塊を粉碎するのが好ましい。粉碎前に乾燥しないと、粉碎機にベトベトに付着して粉碎できないので、粉碎前に乾燥する。かくして得た珪藻粉末に成形助剤、増粘剤、増孔剤、焼結助剤等を加えても良い。本発明者は珪藻土粉末を水だけで造粒するのは著しく困難であるが、多大の苦心と種々の試験研究の結果、珪藻土粉末を水だけで造粒できることを見出した。

【0012】珪藻土粉末を花火の薬玉を造るように、ポットミル型又はパン型のペレタイザーを用いて、約4～5mmの種粒を目標として一次造粒する。種粒の大きさは製品の用途に応じて変更できる。

【0013】一次造粒後、篩別し、種粒より小さい小粒は一次造粒に戻して再造粒すると、略々均一な大きさの種粒が得られる。一次造粒は二次造粒と異なり、造粒機を加温すると造粒できない。

【0014】種粒を二次造粒するときは、造粒機を加温する必要がある。造粒機は触って若干温いように、容器を外壁から直火で約30℃以上に加温するが、加温費用等の経済的観点から上限は約60℃以下である。好適な温度は約40～50℃である。

【0015】二次造粒にあたっては、種粒の表面が乾いて見える状態を保ちながら、種粒に珪藻土粉末と水を供給して造粒機を加熱しながら造粒すると、粒径の揃った粒が得られる。加熱しないと時間が掛る上、粒径の揃った粒は得られない。通常、飲料水用には直径約18mmのものを造粒し、風呂、プール用には直径約10mmのものを造粒し、食品用には直径約40mmのものを造粒する。

【0016】二次造粒物は乾燥して付着水分を除去する。乾燥は品質とコストの面から自然乾燥が好ましく、特に直射日光を避けた自然乾燥が好ましいが、二次造粒物が割れずコスト面から許容されれば強制乾燥でも良い。

【0017】焼成は単純な焼成方法では焼成できず、二

段焼成する必要がある。一次焼成は150～250℃で10～20時間の長時間を掛けて行ない、温度が低ければ焼成時間が長く、高ければ焼成時間が短い。通常は180～220℃で10～14時間である。

【0018】二次焼成は600～900℃で4～24時間行なう。通常、飲料水と食品用水は焼成前に約1.1%含んでいた硫黄分Sを揮発除去して焼成後約0.25%迄落とすように、約800～860℃で20～24時間焼成し、風呂用は適度硫黄分Sが有った方が好ましい為、約4～5時間の短時間焼成する。焼成はガス炉、石油炉は良くなく、電気炉が良い。

【0019】

【作用】第3表から明らかなように、従来の吸着剤は細孔半径が小さい為、臭いしか吸着できず、多種類のイオン交換はできないが、本発明に用いる珪藻土は細孔半径が大きい為、臭いを吸収できるのみならず、多種多量のイオンを交換できる。

【0020】本発明は第1表及び第2表に例示したような珪藻土を、如何にして大きな細孔を破壊せずに造粒し焼成するかに苦心し、遂に成功したものである。球形に丸く造粒すると、多孔を保てる上、取扱が容易であり、均等に充填し易い。また、表面が焼結した粉によりザラザラになっても、ザラザラが落ちない為、多孔が保てて活性能力が落ちない。低温で一次焼成する為、ガスが抜けて珪藻土粒子間に多孔を生成するのを邪魔せず、二次焼成では珪藻土粒子が溶けてガラス化しない温度で焼成する為、細孔が塞がれない。

【0021】本発明の活水剤は六角形の斜けい構造を有し、多孔質である為、水中の不純物赤錆、水垢を吸着する。また、カルシウム、マグネシウム、カリウム等のミネラル分を豊富に含有する為、水を美味とし、美肌作用があり、動植物成長促進作用がある。さらに、ミネラルイオンを中心として水分子を3～4分子の小集団(クラスター)として水を活性化すると共に、遠赤外線放射作用がある為、水の悪臭、汚れが減少し、湯が早く沸くので経済的であり、湯がまるやかで温泉作用があり、炊飯、煮物、天ぷら、漬物等の料理を美味迅速とする作用



があり、味噌汁、パン、のり、野菜、果物、酒、コーヒ一、紅茶、めんつゆを美味とし、日持を良くする作用がある。さらにまた、土中の不溶石灰、重金属、農薬等もイオン交換で分解し、雑菌の繁殖を抑制し、有用微生物とプランクトンを活発に活動させ、酸性雨を中和する作用がある。

【0022】本発明の活水剤は、Mg、Ca等のミネラル分を多量に含有し、水中で適量長期間のミネラル分を溶出する為、ミネラル分が水分子集団（クラスター）の中心となって、水分子集団を小さくする。通常、小さく 10 になった水分子集団も、時間が経過すると元の大きな水分子集団に戻ってうが、本発明の活水剤は6~14 $\mu$ mの

波長の遠赤外線を放射するので、ミネラル分の原子の外

#### 本発明の活水剤の化学成分

殻電子が基底状態から励起されて活性化する為、水分子集団が小さい時間が長く持続する。Ca等のミネラル分のイオンの周囲に集合する水分子集団が例えば3分子であると、ミネラル分の無い場合の水分子集団の例えば12分子に比べて、Ca等のミネラル分が働き易くなる。この為、本発明の活水剤は活性が高く、単なる浄水剤ではない。

【0023】本発明の活水剤の一分析例を第4表に、水処理した場合の一分析例を第5表に、遠赤外線スペクトルの一例を第1図に、処理した水をNMRにより測定した振動波長の一例を第2図に示す。

【0024】

【表4】

成 分	分 析 結 果 (%)	分析方法
SiO <sub>2</sub>	71.3	重量法
Al <sub>2</sub> O <sub>3</sub>	12.00	ICP法
Fe <sub>2</sub> O <sub>3</sub>	5.33	"
CaO	3.45	"
MgO	1.62	"
K <sub>2</sub> O	2.60	"
Na <sub>2</sub> O	2.39	"
TiO <sub>2</sub>	0.33	"
S	0.25	重量法
P <sub>2</sub> O <sub>5</sub>	0.11	"
CoO	0.022	"
MnO	0.11	"
B <sub>2</sub> O <sub>3</sub>	0.001	"
BaO	0.043	"
SrO	0.020	"
SnO <sub>2</sub>	0.001以下（検出限界）	"
ZnO	0.18	"
V <sub>2</sub> O <sub>5</sub>	0.010	"
NiO	0.12	"
CuO	0.002	"
Pb	0.002以下（検出限界）	"
Cr	0.003	"
Ge	0.001以下（検出限界）	"

（株）日本化学環境センターの分析による）

【0025】

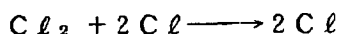
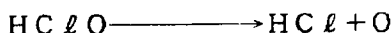
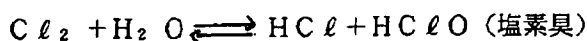
【表5】

## 水を処理した場合の分析例

(mg/l)

水 中 元 素	処 理 前	処 理 後
カルシウム	0.25	205.86
カドミウム	1.81	< 0.003
銅	107.74	0.10

(新日本製鉄銻銻石製所銻石試験分析センターにて分析)



【0027】本発明の活水剤はイオン交換容量が大きい。効力が高いので、使用量が少なく済む。受水槽の中に従来の浄水剤と交換して使用できる。濾過剤は不要である。温泉とかプールでは濾過機の濾過剤にそのまま代用できる。処理した水を農業に用いると、植物に害虫が付き難くなる為、低農薬化が実現できる。また、使用した農薬を吸収し、薬害を減少させる効果がある。

【0028】

【実施例】次に本発明を実施例につきさらに詳細に説明する。

## 実施例1

第1表に示す組成の珪藻土を薄く拡げて天日乾燥で2～3日乾燥し、クラッシャーで50～150メッシュ50重量%、150～300メッシュ30重量%、300メッシュ以下20重量%の粒度に粉碎した。この粉末を造粒機で水を用いて花火の薬玉を造るように直径約4～5mmの種粒を製造した。約4mmより小さい粒は篩別して造粒機に戻した。種粒をバン型ベレタイザーに入れ、バンの底面を下方からプロパンガスバーナーで約40℃に加熱しながら、球の表面が乾いた状態に見えるように留意しながら、水と珪藻土粉末を添加して造粒した。造粒物の大きさは直径約18mmの飲料水用のものと、約10mmの風呂、プール用のものと約40mmの食品用のものと3種類とし、夫々略々均一な粒径のものを得た。得たる造粒物を粒径に応じて5～20日間陰干にして乾燥した。次いで200℃で12時間一次焼成した後、850℃で飲料水用及び食品用のものは24時間二次焼成し、風呂、プール用のものは4時間焼成した。かくて得た活水剤の物性は第1図に、化学成分は第3表に示す通りであった。水を処理した場合の振動波長は第2図に示す通りであった。飲料水用の本発明の活水剤約5kgで水1tを6時間処理したところ、処理前と処理後では第3表に示すように重金属が吸着されて減少し、カルシウムイオンが多量に溶出していた。

【0029】植物、農作物用、池、生け簀用又は風呂、プール用には水1tにつき約1kgを使用すると、植物が成長し、水が清澄化し臭いがなくなった。飲料水用には

【0026】カルシウムイオンの溶出が多い水処理剤を使用した場合、pHは8～9位に高くなるが、本発明の活水剤は溶出量が200mg/l程度で平衡に達するようで、pH約7.2の弱アルカリ性が保たれる。プールの水を処理すると残留塩素が吸着され、塩素臭が減少する。これは次の反応式による。

【数1】

水1tにつき約5kgを使用すると、適量なミネラルを含む美味しい水になった。食品用は水1リットルに40mm径のもの2ヶを目安にして使用すると美味になり、日持が良くなった。

【0030】

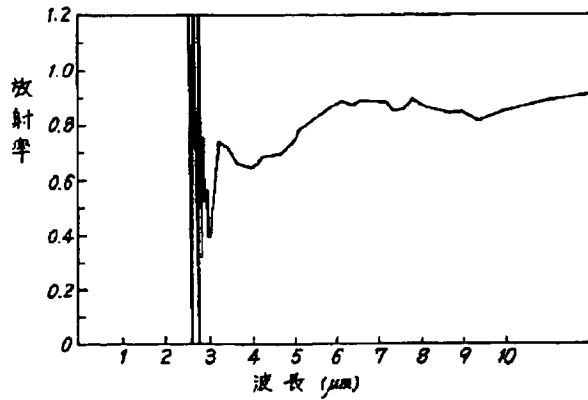
【発明の効果】本発明の活水剤は、水中の汚れ、不純物、赤錆、水垢、悪臭を除去し、ミネラルを豊富に含む美味しい飲料水とし、化学肥料や農薬等を無害化してゴルフ場や農場のプランクトン、微生物、動植物を活性化し、成長を促進し、水分子集団（クラスター）を小さくし、遠赤外線作用により湯が早く沸き経済的であると共にまろやかであり、保湿ミストにすると乾燥肌にうるおいを与えるので美肌効果があり、加湿器の水タンクに入れると室内の保湿効果が高まり、処理水を噴霧すると髪がしっとりし、しなやかになり、タオル蒸し器内に入れるとタオルがふっくらし悪臭が付かず、うどん、そば、菓子、パン等の記事の熟成が早くなり、生花が長持ちし、炊飯、煮物、天ぷら、漬物等の料理を美味且つ迅速にし、味噌汁、パン、海苔、煮干、昆布、ワカメ、酒、コーヒー、紅茶、茶、めんつゆ等を美味とし且つ日持を良くし、野菜、果物の鮮度を保ち、酸性雨を中和し、低農薬化を実現でき、使用量が少なく済む。また、従来の浄水剤、濾過剤、麦飯石にそのまま代用できる為余分のスペースを必要としない。

【0031】風呂、プール等に使用すると、従来の濾過剤を購入する場合に比べて設置費を約70%軽減でき、水抜き回数が減少して費用を約30%軽減でき、沸し湯の電気代が約20%減少できた。

【0032】本発明の活水剤200ヶをドラム缶の水200リットル中に24時間入れ、この水を菊とゴルフ場の芝に約2ヶ月間毎日散水したところ、水道水を散水した菊と芝に比べて約3倍も成育が良く、緑が濃かった（参考写真1～2参照）。また、本発明の活水剤10ヶを1リットルの水に6時間入れ、この水をカランコエ及びスパティヒラムに夫々1ヶ月及び5ヶ月間毎日散水したところ、水道水を散水した草花に比べて約2～3倍も成育が良か

った（参考写真 3 ～ 4 参照）。さらにまた、200 c c の水を入れたガラス瓶に榊を挿し、本発明の活水剤を 2 ケ入れて置いたところ、3 ヶ月経っても榊が枯れず、逆に新しい枝が発芽して旺盛に成長し、今だに成長を続けている（参考写真 5 参照）。

【図 1】



【図面の簡単な説明】

【図 1】本発明活水剤の遠赤外線スペクトルの一測定例を示す図。

【図 2】本発明活水剤で処理した水の振動波長の一例を示す図。

【図 2】

